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ABSTRACT

A schema-based technique designed to improve students' use of feedback on their performance on classroom tests was partially tested. Subjects were 16 female undergraduates separated into two groups based on grade point average (GPA). The training program required that one class meeting after each classroom exam be used as a feedback session. A 50-item multiple-choice pretest, four midterm exams, and one final were administered. The separation of subjects into high and low ability groups for the purpose of analysis provided groups that differed in ability as well as GPA. Lower ability students improved in their processing of feedback, as demonstrated by error analysis. Limitations of the study and implications for education and for the use of schema theory for the development of instructional techniques are discussed. (Author/PN)

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Improving the Use of Classroom Feedback

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Paper presented at the meeting of the American Educational Association (April, 1984), New Orleans. Dr. Bender is now in the Psychology Department at Southwest Missouri State University.

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Abstract

A schema-based technique designed to improve students' use of feedback on their performance on classroom tests was partially tested. Lower ability subjects improved in their processing of feedback, as demonstrated by an error analysis. Implications for education and the use of schema theory for the development of instructional techniques are discussed.

Improving the Use of Classroom Feedback

Feedback following classroom tests should be both formative and summative. In other words, students should treat examination performance feedback as a source of information for further learning. If this information is efficiently processed, learning should improve. This study consists of a brief description and analysis of a simple training technique designed to facilitate students' use of feedback on classroom multiple-choice test performance. Bender & Phye (1979) found all students do not benefit from feedback sessions equally. Higher ability students may more carefully review each item than may lower ability students. The training technique was designed to improve students' use of feedback in classroom examination feedback sessions.

Effective use of feedback is considered to be a trainable skill. This skill is conceptualized as a type of procedural schema (Royer, 1979; Rumelhart & Norman, 1981). Figure 1 illustrates the

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Insert Figure 1 about here

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general procedure in such a schema. Students who use this type of schema should be making the most efficient use of feedback for correcting incorrect items and for clarifying items about which the students were unsure. The training program consisted of building these schemata by informing the students of the functions of effective feedback and providing them with a procedure designed to

facilitate the fulfillment of these functions.

Effective classroom feedback serves three functions. Feedback disconfirms incorrect knowledge. Disconfirmation would occur with a negative response to the first question in Figure 1. Disconfirmed information is also corrected by informative feedback. Correction would occur with the processing of information from various sources following disconfirmation. Finally, feedback confirms the appropriateness of the correct responses about which students were unsure. This confirmation function occurs through the processing of information following review of a correct item.

If feedback does not serve these functions, and a pretest-posttest design is employed in instruction, a number of error patterns emerge (Phye, Gugliemella, & Sola, 1976). A perseverative error occurs when feedback is not processed and the student fails an item by choosing the same incorrect response on each test. A different error occurs when feedback disconfirms, but does not correct the student's knowledge schema. The student fails an item on the posttest by chooing a different, but still incorrect alternative. Finally, a new error occurs when feedback does not confirm information; therefore, the student fails a previously correct item. If students were informed of the functions of feedback, then trained how to use feedback sessions to facilitate these functions, their use of feedback sessions should improve. This improved use of feedback should appear in the error patterns committed by the students, especially the lower ability students.

Method

Subjects

Subjects were 16 students from introductory psychology courses at a small, private, liberal-arts college for women. Students were selected on the basis of attendance and were separated into two ability groups on the basis of first semester grade point average. The separation into ability groups was for the analysis only.

Procedure

The training program required one class meeting following each classroom exam be used as a feedback session. During the first feedback session, students were informed of the functions of effective feedback. Students were then told they would be given their corrected answer sheets and a copy of the exam, and that they should review the exam in the following manner. First, they should note those items they answered incorrectly and note the correct answer. Second, they should search the text and their notes for support for the correct answer. Third, they should review those items they answered correctly and review the text and notes concerning those items for which they were uncertain. If students were unable to locate information concerning an item, they were to ask the instructor, who provided the information and its location.

All subjects were administered a 50 item multiple-choice pretest, four midterm exams, and one final. The pretest consisted of five sets of ten items each, from each fifth of the course. The appropriate set of items was repeated on each midterm and the final. Ten new items from each midterm were repeated on the final. The

final also contained new items from the last fifth of the course. All of the repeated items were written before the beginning of the term and covered a wide sample of the course content.

Review sessions followed the four midterms and lasted for the entire 50-minute class period. Subjects were not allowed to keep their exams or to copy items. To further control for the amount of exposure to each exam, the number of hours spent reviewing the exams outside of the classroom was also recorded for each student.

Results

The proportion of corrected items, new errors, perseverative errors, and different errors were recorded for both the pretest items repeated on the midterms, and the midterm items repeated on the final. The proportion of new errors was based on the number correct in the initial test, while the proportions of perseverative and different errors were based on the number of items which were incorrect on both tests. This scoring procedure differs slightly from that of Bender & Phye (1979). The total number of points for the course, the number of repeated midterm items correct on the final, and the total final raw score were also recorded.

Indepentent *t*-tests were used to compare the dependent measures between ability groups. Higher ability subjects had a higher mean GPA than the lower ability subjects $t(14) = 6.86$, $p < .001$, with a mean GPA for higher and lower ability groups of 3.35 and 1.95, respectively. Higher ability subjects corrected a greater proportion of errors from the pretest to the midterms $t(14) = 2.28$, $p < .05$,

with mean arcsin transformed proportions of corrected errors for the high and low ability groups of 1.99 and 1.67, respectively. High ability subjects also committed a lower proportion of perseverative errors from the pretest to the midterms, $t(14) = 2.30$, $p < .05$, with mean transformed proportions of perseverative errors for high and low ability groups of 0.78 and 1.05, respectively. No significant differences were found between the performances of the high and low ability groups as reflected by error patterns from the midterms to the final.

Higher ability subjects scored higher on the overall final $t(14) = 2.17$, $p < .05$ than did lower ability subjects, but not on items repeated from the midterms. The mean final score for the high and low ability groups was 57.875 and 48.375, respectively. Higher ability subjects also attained more total points for the course, $t(14) = 3.11$, $p < .01$, with mean total points for high and low ability subjects of 220.75 and 195, respectively. No differences were found in the total number of hours spent reviewing the exams.

Changes in performance within ability groups were analyzed by one-way repeated measures ANOVAs for each error type and the proportion of corrected errors. No changes were found for the high ability subjects. Low ability subjects improved in the proportion of errors corrected $F(1,7) = 10.1456$, $p < .05$, with mean transformed proportions of corrected errors of 1.67 and 2.26 for the midterms and final, respectively. Low ability subjects also reduced their proportion of different errors $F(1,7) = 8.0095$, $p < .05$, with mean

transformed proportions of different errors from the midterms and final of 0.91 and 0.38, respectively.

Discussion

The separation of subjects into high and low ability groups for the purpose of analysis did provide groups which differed in ability as well as GPA. Error patterns from the pretest to the midterms reflect learning from the text and lectures. Higher ability subjects appeared to have benefited more from instruction than did lower ability subjects. The results for the perseverative errors indicate that instruction may have served to correct the incorrect preconceptions better for the high ability subjects than for the lower ability subjects.

Error patterns from the midterms to the final reflect learning from feedback sessions. Previous research indicated that lower ability subjects may process feedback less effectively than do higher ability subjects (Bender & Phye, 1979). Unfortunately, this result could not be replicated, as there were no high or low ability subjects who did not receive the feedback training in this study. However, feedback training sessions appeared to have improved the processing of feedback on classroom exams of the lower ability subjects. This improvement was reflected in the improvement of the proportions of corrected and different errors to a level which was not significantly different from that of the higher ability subjects. Learning the functions of feedback and how to use feedback sessions to fulfill these functions helped

lower ability subjects develop more effective procedural schemata for feedback sessions.

These results illustrate the potential usefulness of schema theory in the design of instructional techniques. Schema theory is a very eclectic, diverse area of cognitive psychology. Schemata have been defined in various ways. The term is used in a very general sense here to mean a functional label for any set of mental processes which occur together regularly and are used to represent information or strategies for using information. Thus, schema may be reducible to physical events which occur within the brain, and may be composed of separately identifiable events. However, it may not be necessary for every learner to have identical physical events occurring within the brain when solving identical problems. The mental processes are inferred from behavior, and the term schema is a functional label for these processes. Therefore, schema survive only through their demonstrated usefulness.

The results of this study start to demonstrate the usefulness of the conception of a schema for the use of classroom feedback. Although this study involved the use of classroom exam performance feedback, the function of feedback in any information-processing situation is the same. In a cognitive monitoring system of problem-solving (Flavell, 1979) feedback is used to confirm the appropriateness of current strategies, disconfirm inappropriate strategies, and correct the learner's knowledge concerning which problem-solving strategies are appropriate in specific problem situations.

Although the results are encouraging for the development of practical instructional techniques from schema theories, there are a number of limitations of this study which should be considered to prevent the possibly premature application of these results to the general classroom. The first limitation concerns the method. The sample of subjects was very small and select. There was no random assignment of the subjects to conditions, as the conditions were determined by GPA. Furthermore, no control group which did not receive instruction in the use of feedback was included. Generalizations should not be made from any single study. Replication of these results with a variety of classes and appropriate control groups needs to be attempted.

The second limitation concerns the finding that the low ability subjects appeared to improve only on the repeated items. Apparently instruction in the use of feedback does improve the performance of lower ability subjects on repeated items. However, it is not clear whether this improved performance is due to better knowledge of the material or memory for the specific answer to a specific question. Therefore, paraphrased as well as verbatim items need to be used in the posttests.

Finally, instruction in the use of feedback is not a panacea for removing the differences between lower and higher ability learners. Hunt (1978) demonstrated that higher ability subjects appear to be better general information processors. Instruction

in the use of feedback may improve the processing schema of lower ability learners in this one aspect of information processing. Other instructional techniques need to be developed to improve the information processing of these learners in other areas.

In conclusion, it may be possible to help learners develop schema for the use of feedback in the classroom with a technique designed to facilitate the confirming, disconfirming, and correcting functions of effective feedback. The technique designed in this study was especially effective in improving the use lower ability subjects made of feedback on specific multiple-choice problems. With more research, using proper control groups and paraphrased posttest items, it may be possible to demonstrate that training in the use of feedback can improve the general feedback processing of learners in a variety of tasks. Finally, the utility of schema theories for use in developing instructional techniques designed to facilitate the information processing of learners has been supported.

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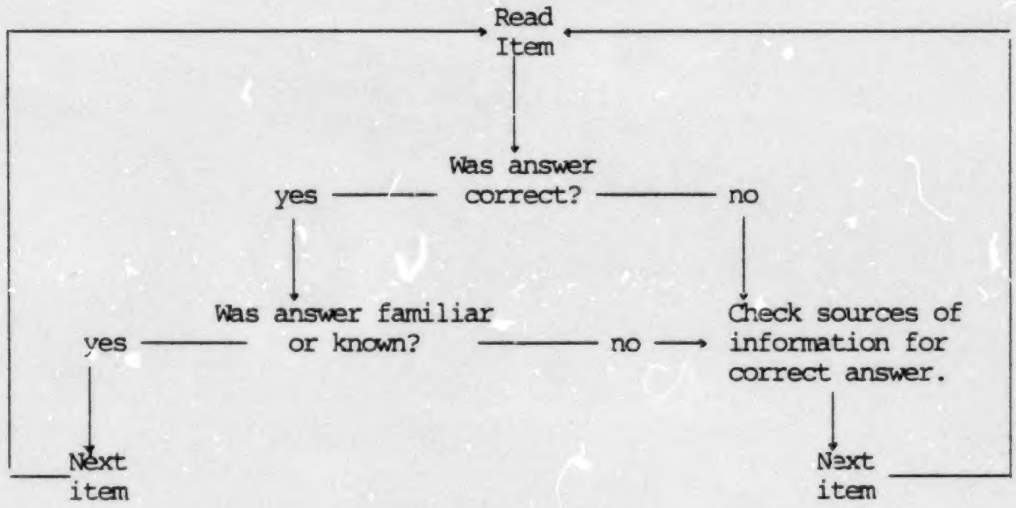

Figure 1. Procedure for effective use of classroom feedback.